A MODEL APPROACH FOR TRITIUM DYNAMICS IN WILD MAMMALS AND BIRDS

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The transfer through the environment of tritium (^{3}H) must be modelled differently than the transfer of other radionuclides released from nuclear reactors because hydrogen represents the building blocks of life. A solid understanding of the behaviour of ^{3}H in the food chain is essential because ^{3}H may be released in large quantities from CANDU (CANada Deuterium Uranium) reactors and from future thermonuclear reactors. Recently, the authors published a complex dynamic metabolic model for ^{3}H and ^{14}C transfer in farm and wild animals, but the model’s applications for wild biota were restricted to too few examples and mostly for ^{14}C transfer. In this paper, the model is applied to a larger selection of wild animals and birds, covering the examples found in the Canadian Standard (CSA N288.1, 2008) and the Reference Animals proposed by the International Commission for Radiological Protection and the International Atomic Energy Agency, as well. Wild mammals generally have a lower fat content than domestic animals and must adapt to variable environmental conditions. The body mass remains the major factor in determining radionuclide transfer. Environmental temperature, type of animal, and diet must be also considered. Model input parameters for wild mammals are poorly defined because of paucity of environmental measurements, and intraspecific variability is higher than for farm and laboratory mammals. Despite the lack of any experimental data for wild animals, the results presented in this paper for ^{3}H transfer are less uncertain than for many other radionuclides and can provide useful estimated for the radioprotection of biota. Because a lack of data for organ metabolism in birds, the results for birds are preliminary and subject to more uncertainty than for wild mammals. In absence of experimental data or previous modelling assessment, the model presented here is a first attempt to predict the transfer of ^{3}H in birds.

A novel approach – the use of energy metabolism and the link between energy and organic matter turnover rate at whole body and organ level – to modelling the transfer of ^{3}H to adult mammals has been improved and extended to address wild mammals and wild birds. Despite some limitations, due to a generic approach or limited knowledge of *in vivo* specific metabolic rates of organs of various types of animals, the results presented here demonstrate that food chain modelling for radiological assessment can be improved and that doses for non-human biota can be calculated. For better quantitative results, experimental efforts must concentrate on mass and age dependence the specific metabolic rates of organs.